

KBS Demonstration B. Aggarwal, A. Artiles, and W. Shapiro Mechanical Technology, Inc.

The demonstration included five different items; the executive program, three of the industrial codes, and graphical data display capability using current MTI MS-DOS programs. The graphics capability included two- and three-dimensional plots viewed from different angles. This capability will be ported to OS/2 and made an integral part of the KBS executive program.

The executive program has a button for each industrial code and facilities to print and browse input and output files generated by the analysis codes. The plotting capability will be added in the future. The user can start any of the codes by clicking on the button for the code. The number of codes running simultaneously is limited only by the amount of memory available on the machine. Multitasking capabilities of OS/2 are exploited to perform printing, browsing and analysis functions in parallel.

The three codes demonstrated included Spiral Groove Gas Seals (SPIRAL), Gas Cylindrical Seals (GCYL) and Incompressible Seals (ICYL). SPIRAL and GCYL interface has the standard PM interface while ICYL interface was designed using ToolBook.

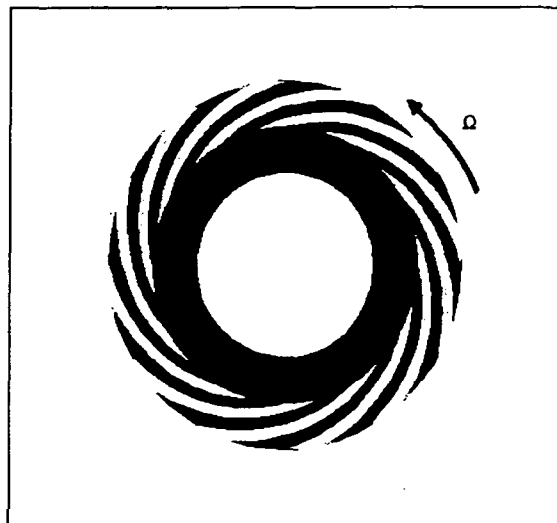
SPIRAL and GCYL have pull down menus to access input screens. The names of the menu items are the same in both programs. Program options are chosen using radio buttons and check boxes instead of entering numbers. Entry fields for numeric information have built in checks to ensure that the numbers are within acceptable ranges. Context sensitive help is provided for all input. When the input is complete, the user may start the analysis by clicking on the analyze button in the menu bar. The output is stored in a user specified output file. The user may also elect to save the input data as a file for future use.

Interactive graphics have been used to ease the input process. In SPIRAL, the user can get immediate feedback during analysis grid specification by clicking on the DRAW button. The program will display the grid as currently specified. In GCYL, the layout of features such as Rayleigh Steps, Recesses, fluid sources, etc. on seal pads is done interactively. The components are laid out on the specified grid using the mouse. This provides a visual representation of the seal pad and avoids having to input a large volume of numerical data. This capability will be extended to include variable grid specification.

ICYL interface shows an alternative approach. The menu items are laid out on the screen in the traditional manner. Submenus appear cascaded on the same screen when a menu item is selected by clicking on it. The concept is similar to the pulldown menus of the standard PM interface. Direct access is provided to any input screen from any other input screen. Menu item names are the same as in SPIRAL and GCYL. Program options and numeric data input procedures are the same as in SPIRAL and GCYL. Arrays of numbers are input using scrollable entry fields. This capability will be added to SPIRAL and GCYL.

SPIRAL-GROOVE CODE

Dr. Jed Walowit



Stator for Spiral Grooved Face Seal

Spiral Grooved Gas Seal Computer Codes

- **Shaft seals and face seals**
- **Compressible flow**
- **Finite eccentricity and misalignment**
- **Four degrees of freedom for shaft seals (three for face seals)**
- **Frequency dependent dynamic coefficients**
- **Arbitrary end pressures**
- **Predicts load, flow, power loss, dynamic coefficients, shaft displacements and minimum film thickness**

ICYL (Incompressible Cylindrical Seals) Code

Dr. Antonio Artiles

MTI

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PROGRAM ICYL

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CAPABILITIES

- 2-D incompressible isoviscous flow in cylindrical geometry
- Rotation of both rotor and housing
- Roughness of both rotor and housing
- Arbitrary film thickness distribution, including:
 - Steps, pockets, tapers
 - Preloaded arcs
- Rotor position and velocity is described by four degrees of freedom (translational and rotational)
- External forces and moments may be prescribed to find rotor position
- Pocket pressures or orifice size are prescribed
- Laminar or turbulent flow
- Cavitation
- Inertia pressure drop at inlets to fluid film
 - From ends of seal
 - From pressurized pockets

Computer Code GCYL
(Gas Cylindrical Code)

Wilbur Shapiro

MTI

Computer Code GCYL

The general capabilities of the GCYL include:

- Varying geometries
- Variable or constant grid (30 x 74)
- Shaft eccentricity and misalignment
- Specified boundary pressures and periodic boundary conditions
- Symmetry in axial direction
- Determining load (function of displacement) or seal position to satisfy given load
- Choice of English or SI units.

The output of the program include:

- Clearance distribution
- Pressure distribution
- Leakage at specified flow paths
- Load and load angle
- Righting moments
- Viscous dissipation
- Cross-coupled, frequency-dependent, stiffness and damping coefficients
- Plotting routines (pressure and clearance distribution)